

# OPAL Wales Curriculum Links for Key Stage 4 for Science A GCSE (WJEC)



The Water Survey	Wjec Science A; Biology 1; Adaptation, evolution and Body Maintenance (4461 paper 02)
<p>Pupils find and identify aquatic invertebrate (pond skaters, snails, dragonfly nymphs) and use their presence to determine the quality of the water. They can use pH paper to test how acid the water is.</p>	<p><b>1) Variety of life, adaptation and competition</b></p> <p><i>A) Understand that living organisms show a range of sizes, features and complexity.</i> The Water quality survey shows students that freshwater invertebrates are very diverse</p> <p><i>B) Know that organisms which have similar features and characteristics can be classified together in a logical way. Morphological features can be used.</i> The Water quality survey gives students hands of experience of this via the use of the keys.</p> <p><i>C) Investigate and understand that organisms have morphological and behavioural adaptations which enable them to survive in their environment.</i> The OPAL Water quality survey allows students to investigate this in an enclosed water body, and enables them to develop an enquiry with the key and other resources provided.</p> <p><i>D) The types of organisms in an area are affected by other types of organisms. Investigating the relationships using local or second hand data.</i> The OPAL water quality survey allows students to investigate this through the collection of their own data or via use of data on the web-site.</p> <p><b>2) Monitoring the environment, energy flow and nutrient transfer.</b></p> <p><i>C) Investigate using suitable data, how indicator species and changes in p H and changes in oxygen levels may be used as signs of pollution in a stream . The OPAL water quality survey takes students step by step through a similar investigation in a pond.</i></p> <p><b>How Science Works;</b> The OPAL Soil survey can be used to illustrate this approach within the specification;</p> <p><b>2. Scientific Method.</b> <u>Enquiry and Practical Skills</u></p> <p>1) Pupils can use the Opal water quality survey to plan to test a scientific questions. For example; Use of p H to investigate pollution levels in waterways. The resources can be used to help students improve the accuracy of their enquiry; they could use the freshwater invertebrate key to accurately identify freshwater invertebrates. The OPAL website maps can be used as a source to collect further data.</p> <p>2) Carry out the practical enquiry, working accurately and safely. The OPAL Water quality survey park includes material to help the students plan and carry out a safe investigation.</p> <p><u>Data, evidence, theories and explanations.</u> Pupils can use the survey and the Opal web site data to explore how scientific data can be collected and analysed, and how it can be interpreted.</p>

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The Air Survey	Science A; Biology 1; Adaptation, evolution and Body Maintenance (4461 paper 02)
<p>The Lichen air survey itself is suitable for KS4 and above. Pupils learn how to identify 9 common lichen species, which are classified into 3 groups ; nitrogen tolerant, intermediate sensitivity to nitrogen and nitrogen sensitive. They then measure the abundance of these lichens on local trees, and can use the results to draw conclusions about air pollution locally and particularly the level of nitrogen pollution</p>	<p><b>1) Variety of life, adaptation and competition</b>  <i>A) Understand that living organisms show a range of sizes, features and complexity.</i>  <i>B) Know that organisms which have similar features and characteristics can be classified together in a logical way. Morphological features can be used.</i>                      The Lichen quality survey gives students hands of experience of this via the use of the keys.  <i>C) Investigate and understand that organisms have morphological adaptations which enable them to survive in their environment</i>                      The OPAL Air quality survey allows students to investigate this by looking at the adaptations of lichens for extreme environments, and enables them to develop an enquiry with the keys and other resources provided.</p> <p><b>2) Monitoring the environment, energy flow and nutrient transfer.</b>  <i>C) Investigate how lichens may be used as indicators of air pollution. The OPAL water quality survey takes students step by step through this investigation.</i></p> <p><b>How Science Works:</b>                      The OPAL Air survey can be used to illustrate this approach within the specification;</p> <p><b>2. Scientific Method</b>  <u>Enquiry and Practical Skills</u></p> <ol style="list-style-type: none"> <li>1) Pupils can use the Opal Air quality survey to plan to test a scientific questions. For example; Are there different lichen species on trees near busy roads? The OPAL website maps can be used as a source to collect further data.</li> <li>2) Carry out the practical enquiry, working accurately and safely.                      The OPAL Air quality survey park includes material to help the students plan and carry out a safe investigation.</li> </ol> <p><u>Data, evidence, theories and explanations.</u>                      Pupils can use the survey and the Opal web site data to explore how scientific data can be collected and analysed, and how it can be interpreted.</p>

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OPAL Survey	Science A; Biology 1; Adaptation, evolution and Body Maintenance (4461 paper 02)
<p><b>The Bug Survey</b> Pupils look for bugs in one or more areas of the school grounds for 15mins. They can put their findings on the website <a href="http://www.opalexplornature.org">www.opalexplornature.org</a></p> <p>Teachers can compare their own data with one on the website or carry out two surveys in contrasting areas of the school grounds.</p>	<p><b>1) Variety of life, adaptation and competition</b></p> <p>A) <i>Understand that living organisms show a range of sizes, features and complexity.</i> The Bug survey shows students that invertebrates are very diverse</p> <p>B) <i>Know that organisms which have similar features and characteristics can be classified together in a logical way. Morphological features can be used.</i> The Bug survey gives students hands of experience of this via the use of the keys.</p> <p><b><u>How Science Works:</u></b> The OPAL Bug survey can be used to illustrate this approach within the specification;</p> <p><b>2. Scientific Method.</b> <b><u>Enquiry and Practical Skills</u></b></p> <p>1) Pupils can use the Bug survey to plan to test a scientific questions. For example; Differences in invertebrate species found in different habitats. The OPAL website maps can be used as a source of further data.</p> <p>2) Carry out the practical enquiry, working accurately and safely. Evaluate the methods of collection of data.</p> <p><b><u>Data, evidence, theories and explanations.</u></b> Pupils can use the Bug survey and the Opal web site data to explore how scientific data can be collected and analysed and how it can be interpreted.</p>

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<p><b>The Tree Health Survey</b></p>	<p><b>Science A; Biology 1; Adaptation, evolution and Body Maintenance (4461 paper 02)</b></p>
<p>Pupils compare several trees, measuring their height, girth, and using % to estimate the health of their leaves. They then look for specific pest species. This data can then be compared using charts.</p>	<p><b>1) Variety of life, adaptation and competition</b></p> <p>A. <i>Understand that living organisms show a range of sizes, features and complexity.</i></p> <p>B. <i>Know that organisms which have similar features and characteristics can be classified together in a logical way. Morphological features can be used.</i></p> <p>The Tree survey gives students hands of experience of this via the use of the keys.</p> <p><b>How Science Works;</b></p> <p>The OPAL Tree survey can be used to illustrate this approach within the specification;</p> <p><b>2. Scientific Method</b></p> <p><u>Enquiry and Practical Skills</u></p> <ol style="list-style-type: none"> <li>1) Pupils can use the Tree survey to plan to test a scientific questions. For example; differences in tree growth on different slopes of a valley. The resources can be used to help students improve their enquires accuracy; for example they could use the tree poster so they can accurately identify trees and compare only trees of the same species.</li> <li>2) The OPAL website maps can be used as a source to collect further data.</li> <li>3) Carry out the practical enquiry, working accurately and safely. The OPAL Tree Health Pack includes material to enable pupils in measure the height and girth of trees.</li> <li>4) Evaluate the methods of collection of data.</li> </ol> <p><u>Data, evidence, theories and explanations.</u></p> <p>Pupils can use the Tree survey and the Opal web site data to explore how scientific data can be collected and Analyse how it can be interpreted.</p>

# OPAL Wales Curriculum Links for Key Stage 4 for Science A GSCE (WJEC)



The Biodiversity Survey	Science A; Biology 1; Adaptation, evolution and Body Maintenance (4461 paper 02)
<p>Pupil survey a length of hedge for bugs. The record everything they find, working in 3m sections. They can go onto to compare two different hedges in the school grounds or compare their results with those on the website.</p>	<p><b>1) Variety of life, adaptation and competition</b></p> <p>A. <i>Understand that living organisms show a range of sizes, features and complexity.</i> The Biodiversity survey shows students that invertebrates are very diverse</p> <p>B) <i>Know that organisms which have similar features and characteristics can be classified together in a logical way. Morphological features can be used.</i> The Biodiversity survey gives students hands of experience of this via the use of the keys.</p> <p><b>How Science Works;</b> The OPAL Biodiversity survey can be used to illustrate this approach within the specification;</p> <p><b>2. Scientific Method.</b> <u>Enquiry and Practical Skills</u></p> <ol style="list-style-type: none"> <li>1) Pupils can use the Biodiversity survey to plan to test a scientific questions.</li> <li>2) For example; Differences in invertebrate species found in different habitats. The OPAL website maps can be used as a source of further data.</li> <li>3) Carry out the practical enquiry, working accurately and safely. Evaluate the methods of collection of data.</li> </ol> <p><u>Data, evidence, theories and explanations.</u> Pupils can use the Biodiversity survey and the Opal web site data to explore how scientific data can be collected and analysed and how it can be interpreted.</p>

## OPAL Wales Curriculum Links for Key Stage 4 for Science A (WJEC)



<p><b>The Soil Survey</b></p>	<p><b>Science A; Biology 1; Adaptation, evolution and Body Maintenance (4461 paper 02)</b></p>
<p>The pupils dig a hole measuring 20 cm<sup>2</sup> and count the number of worms they find in it, identifying them using a key. They use pH paper to test the soil and carry out other simple soil tests.</p> <p>They can carry out the survey in one or more areas to compare the results or compare their results with those on the website.</p>	<p><b><u>1) Variety of life, adaptation and competition</u></b>  <i>B) Know that organisms which have similar features and characteristics can be classified together in a logical way. Morphological features can be used.</i>                  The Earthworm survey gives students hands of experience of this via the use of the keys.</p> <p><b><u>How Science Works:</u></b>                  The OPAL Soil survey can be used to illustrate this approach within the specification;</p> <p><b><u>2. Scientific Method.</u></b>  <u>Enquiry and Practical Skills</u></p> <ol style="list-style-type: none"> <li>1) Pupils can use the Soil survey to plan to test a scientific questions. For example; differences in Earthworm species and number in different habitats, or p H and the rate of decay in different soil samples</li> <li>2) Carry out the practical enquiry, working accurately and safely. Evaluate the methods of collection of data. The OPAL soil survey includes p H paper, vinegar, and soil texture test instructions.</li> </ol> <p><u>Data, evidence, theories and explanations.</u>                  Pupils can use the Soil survey and the Opal web site data to explore how scientific data can be collected and analysed and how it can be interpreted.</p>